PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference P24751PC00	**FOR FURTHER ACTION** See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/ZA 03/00087	International filing date *(day/month/year)* 04.07.2003	Priority date *(day/month/year)* 05.07.2002
International Patent Classification (IPC) or both national classification and IPC C07C6/04		
Applicant SASOL TECHNOLOGY (PTY) LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet:

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand 01.12.2003	Date of completion of this report 07.09.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Pérez Carlon, R Telephone No. +49 89 2399-8125

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/ZA 03/00087

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-38 as originally filed

Claims, Numbers

1-26 filed with telefax on 05.05.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-25
	No:	Claims	26
Inventive step (IS)	Yes:	Claims	1-25
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations

see separate sheet

D1: *Angew. Chem. Int. Ed. Engl.* **2000**, *39*, 3012-3043
D2: *Acc. Chem. Res.* **2001**, *34*, 18-29

1. Metathesis products are well known compounds, that cannot be considered as novel when obtained through a different process.

   Claim 26 is not new, in the sense of Art. 33(2) PCT.

2. The Grubbs catalysts known in the art do not contain phosphabicycloalkane ligands (see D1 and D2).

   Claims 1-25 are novel according to Art. 33(2) PCT.

3. No indications were found that would have led the skilled person to choose phosphabicycloalkanes as ligands in order to provide alternative or improved Grubbs catalysts. Documents D1 and D2 disclose the enormous importance of the selection of the appropriate phosphine ligands (see for example D2, bridging paragraph p. 23-24 and D1, p. 3017, right column, l. 8-10) and the difficulty to foresee the effects of any new ligand.

   Claims 1-25 are considered as inventive in the sense of Art. 33(3) PCT.

4. There are no doubts about industrial applicability (Art. 33(4) PCT).

5. The description is not adapted to the claims.

CLAIMS

1. The use of a phosphorus containing ligand as a ligand for a metathesis catalyst in a catalysed metathesis reaction wherein the phosphorus containing ligand is a heterocyclic organic compound in the form of a phosphabicycloalkane with a ligating phosphorus atom as an atom in the heterocyclic ring structure of the heterocyclic organic compound.

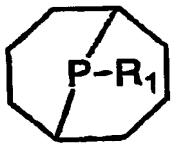
2. The use of a phosphorus containing ligand in the preparation of a catalyst containing the ligand, which catalyst is for use in a metathesis reaction, wherein the phosphorus containing ligand is a heterocyclic organic compound in the form of a phosphabicycloalkane with a ligating phosphorus atom as an atom in the heterocyclic ring structure of the heterocyclic organic compound.

3. The use of either one of claims 1 or 2 wherein the metathesis reaction is a homogenous metathesis reaction.

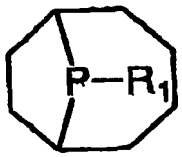
4. The use of any one of the preceding claims wherein the phosphorus containing ligand comprises a phosphine ligand.

5. The use of claim 4 wherein the ligating phosphorus atom is also bound to a further moiety which is an organyl and which is not part of the heterocyclic ring structure.

6. The use of any one of claims 1 to 4 wherein the phosphorus containing ligand is a 9-phosphabicyclo[3.3.1]nonane of formula 2a or a 9-phosphabicyclo[4.2.1] nonane of formula 2b or mixtures thereof:



(2a)



(2b)

wherein R_1 is H or an organyl.

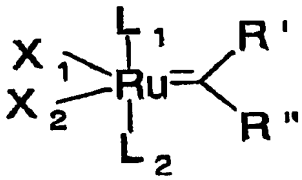
7. The use of claim 6 wherein R_1 is $-C_{20}H_{41}$.

8. The use of claim 6 wherein R_1 is cyclohexyl.

9. The use of any one of the preceding claims wherein the metathesis reaction is a reaction selected form the group consisting of cross metathesis, ring-opening metathesis polymerisation and ring-closing metathesis.

10. A metathesis catalyst which includes a phosphorus containing ligand which is a heterocyclic organic compound in the form of a phosphabicycloalkane with a ligating phosphorus atom as an atom in the heterocyclic ring structure of the heterocyclic organic compound.

11. A compound of formula 3:



.....(3)

wherein

L_1 is a neutral electron donor ligand;

L_2 is a phosphorous containing ligand in the form of a heterocyclic organic compound in the form of a phosphabicycloalkane with a ligating phosphorus atom as an atom in the heterocyclic ring structure of the heterocyclic organic compound;

X_1 and X_2 are independently selected from an anionic ligand; and

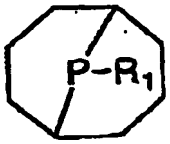
R' and R" are independently selected from H and an organyl.

12. The compound of claim 11 which is a homogeneous metathesis catalyst.

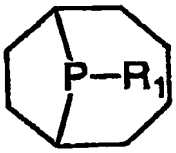
13. The compound of either one of claims 11 or 12 wherein L_1 is the same as L_2.

14. The compound of any one of claims 11 to 13 wherein the phosphorus containing ligand of L_2 comprises a phosphine ligand.

15. The compound of claim 14 wherein L_2 is a 9-phosphabicyclo[3.3.1]nonane, of formula 2a, or a 9-phosphabicyclo[4.2.1] nonane of formula 2b or mixtures thereof:



..... (2a)



..... (2b)

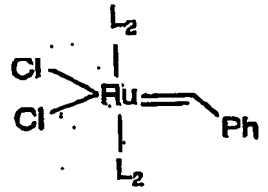
wherein R_1 is H or an organyl.

16. The compound of claim 15 wherein R_1 is $-C_{20}H_{41}$.

17. The compound of claim 15 wherein R_1 is cyclohexyl.

18. The compound of any one of claims 11 to 17 wherein X_1 and X_2 are each independently selected from halide.

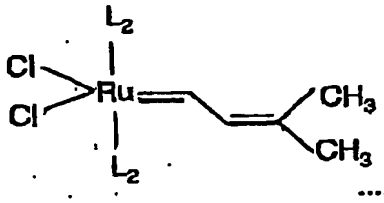
19. The compound of claim 11 which is a compound of formula 7:



.....(7)

wherein L_2 is the same or different and is as defined in claim 11.

20. The compound of claim 11 which is a compound of formula 8



.....(8)

wherein L_2 is the same or different and is as defined in claim 11.

21. The compound of either one of claims 19 or 20 wherein L_2 is as defined in claim 15.

22. The use of a compound of any one of claims 11 to 20 in a metathesis reaction.

23. The use of claim 22 wherein the metathesis reaction is a homogeneous metathesis reaction selected from the group consisting of cross metathesis ring-opening metathesis polymerisation and ring-closing metathesis.

24. A catalysed metathesis reaction wherein at least one olefinic compound is subjected to metathesis in the presence of a compound of claim 11.

25. The reaction of claim 24 wherein the compound of claim 11 is formed *in situ*.

26. A metathesis product formed by the reaction of either one of claims 24 or 25.